

SCIENCE

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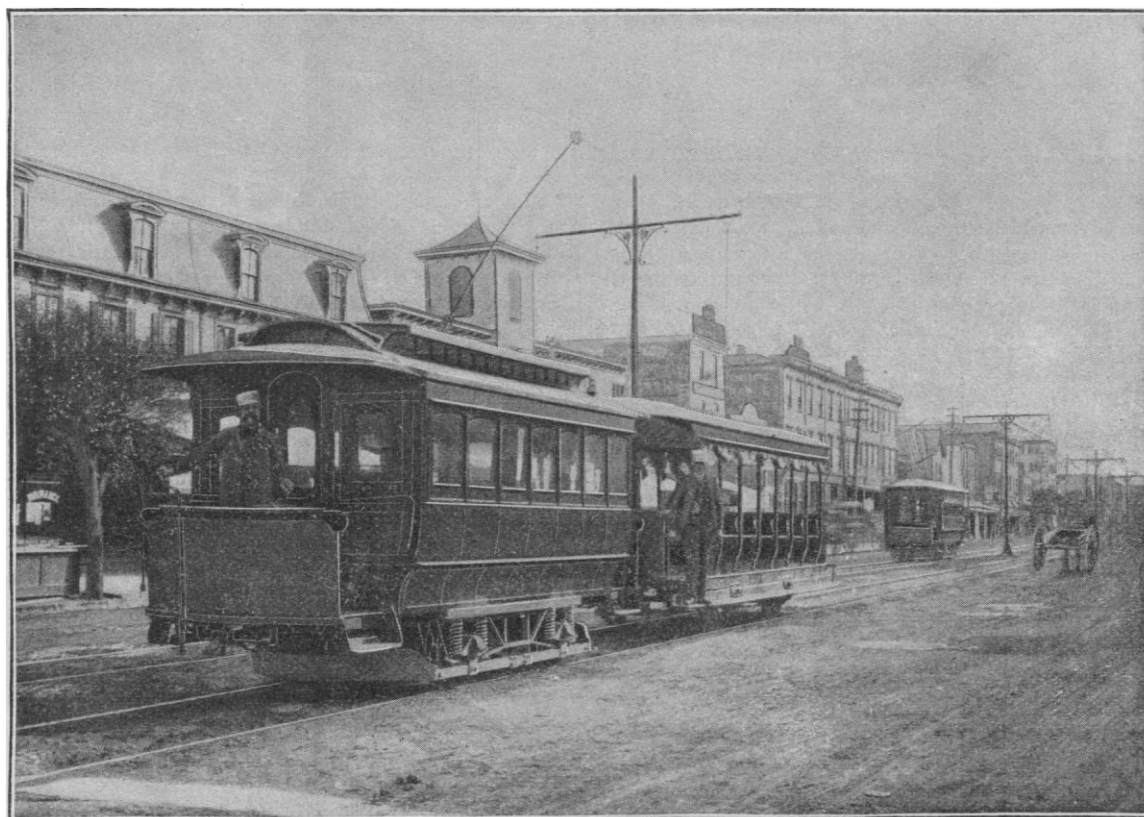
A GOOD RECORD FROM ATLANTIC CITY.

THE road which has been running upon the Sprague electric system at Atlantic City, N.J., continues to be visited by a large number of street-railway men from all parts of the country, and electricians and others interested in electric traction. A record of the operation of this road since the first cars were started shows that a grand total of 6,464 separate trips have been taken by the cars in operation upon this road. During this time, and in spite of the fact that the motors used upon this road were of the new Sprague type, which had hitherto not been tried upon any road, not a single

order has been increased to sixteen electric cars, each capable of drawing an additional car.

One noticeable characteristic of this road is the extremely light and ornamental character of the overhead system. The poles are of iron throughout the entire length of the line, and are placed between two tracks, using the double-bracket method of support for the trolley-wire. These poles, which were put up by the Pennsylvania Railroad Company, show how unobjectionable a system using overhead wires may be when sufficient regard is paid to this feature of the system.

The accompanying engraving gives a view of one of the Sprague



SPRAGUE ELECTRIC RAILWAY AT ATLANTIC CITY, N.J.

trip was lost by the electric cars. This is a record which it would be hard to duplicate in the records of any other machine used for the first time, and it is only additional evidence toward showing the superiority of the electric motor in simplicity, efficiency, and durability to other types of machines, and the care with which the leading electric supply companies are building their apparatus. The original order of the Pennsylvania Railroad Company, which controls the system of street-railways at Atlantic City, was for six cars, each to be equipped with two 15-horse-power Sprague motors, and each to be capable of drawing an ordinary street-car. Since the demonstration of its successful operation at Atlantic City, this

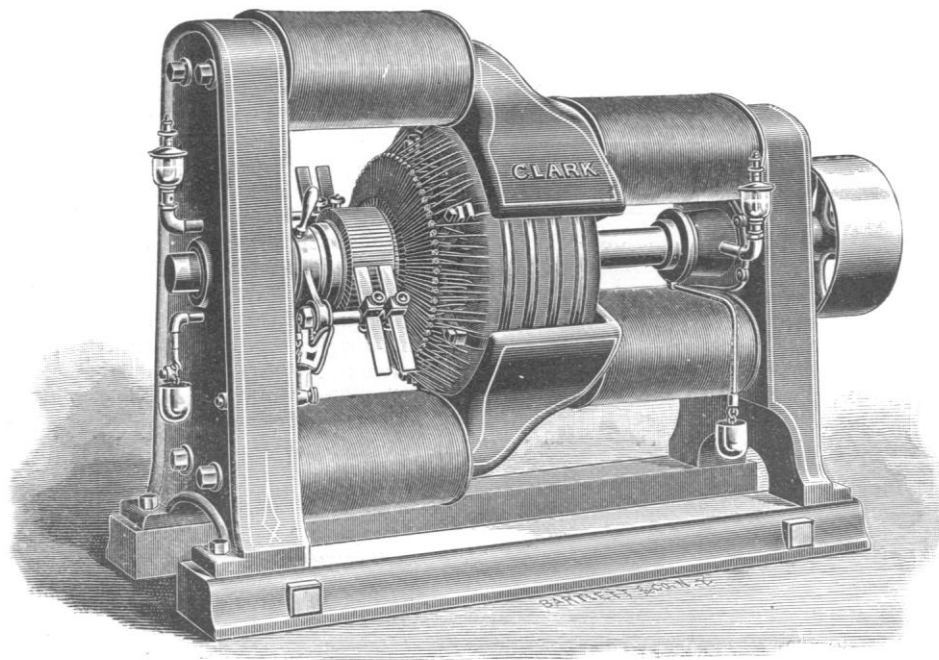
electric cars in operation at Atlantic City, N.J., drawing one ordinary car.

At the annual meeting for the election of fellows of the Royal Society, London, on June 6, the following were elected: John Aitken, Dr. Edward Ballard, Alfred Barnard Basset, Horace T. Brown, Latimer Clark, Professor David Douglas Cunningham, Lazarus Fletcher, William Botting Hemsley, Charles Thomas Hudson, Professor Thomas McKenny Hughes, Edward B. Poulton, Professor William Johnson Sollas, Charles Todd, Herbert Tomlinson, Professor Gerald F. Yeo.

THE CLARK ELECTRIC COMPANY'S APPARATUS.

THE accompanying illustrations show the new apparatus of the Clark Electric Company. The dynamo shows some points of interest in details. It has an unusually long and deep commutator, provided with two independent brushes on each side, either one of

sent not only to the outside of the armature, but to its inner surface as well; and by this means an enormous increase of the polar surface is secured, which is claimed to render the wire cores more effective than a sheet-iron core. The machines are shunt wound, and are claimed to be the only high-tension arc-light machines so constructed. They are calculated throughout to secure the highest

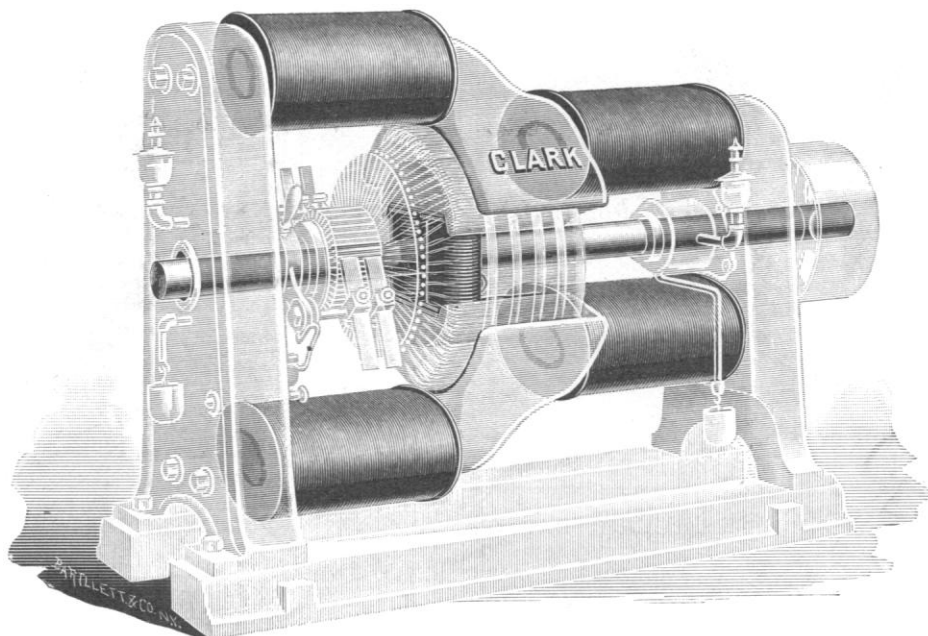


CLARK ELECTRIC COMPANY'S DYNAMO.

which is able to carry the current, thus allowing the brushes to be changed or turned over while the machine is in operation. The shaft is very strong, being made of cast steel, and runs in gun-metal bearings. The armature cores are made of cotton-insulated iron wire wound into the proper form. A better division of the

possible efficiency, and it is stated that after a long run no portion of the machine is ever found uncomfortably warm to the hand.

The principles on which the Clark automatic regulator works will need a word of explanation. The dynamos made by the Clark Company are shunt wound; and instead of using an adjustable



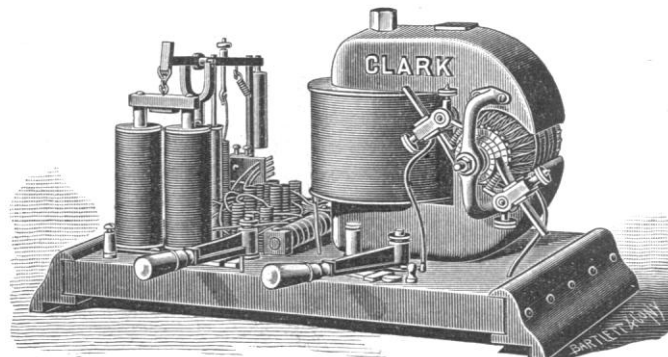
CLARK ELECTRIC COMPANY'S DYNAMO, SHOWING INTERIOR FIELD.

iron is thus obtained than by making the cores of sheet-iron rings with insulating material between them; but, as the core in this method of construction is laminated in both directions instead of only in one, its magnetic resistance is somewhat increased, which is a serious objection to such cores in most machines. In these machines, however, the pole-pieces of the field-magnets are pre-

reostat in the field-magnet circuit, as is the usual practice with machines of this class, the exciting current is varied by means of an adjustable counter electro-motive force. This is accomplished as follows: the armature of the small regulating-machine shown in the cut is included, by means of its brushes and commutator, in the field-magnet circuit of the dynamo. This armature is of the Sie-

mens type, but wound with a large number of turns of fine wire, as the current passing through it is very small, in the arc machines never exceeding .4 of an ampère. When the current passes through the circuit, the armature revolves, and the machine becomes a motor, of course setting up a counter electro-motive force, the amount of which will depend upon the velocity of revolution of the armature, and the strength of the field in which it revolves. The speed of the armature is limited to a certain number of revolutions per minute by means of a small belt running from the pulley on the armature shaft to another one on the dynamo shaft, or on a line shaft, or some other revolving shaft whose speed is constant. As the speed of the armature cannot change, its counter electro-motive force can only change by reason of a change in the magnetic strength of its field-magnets. The main current, on its way to the

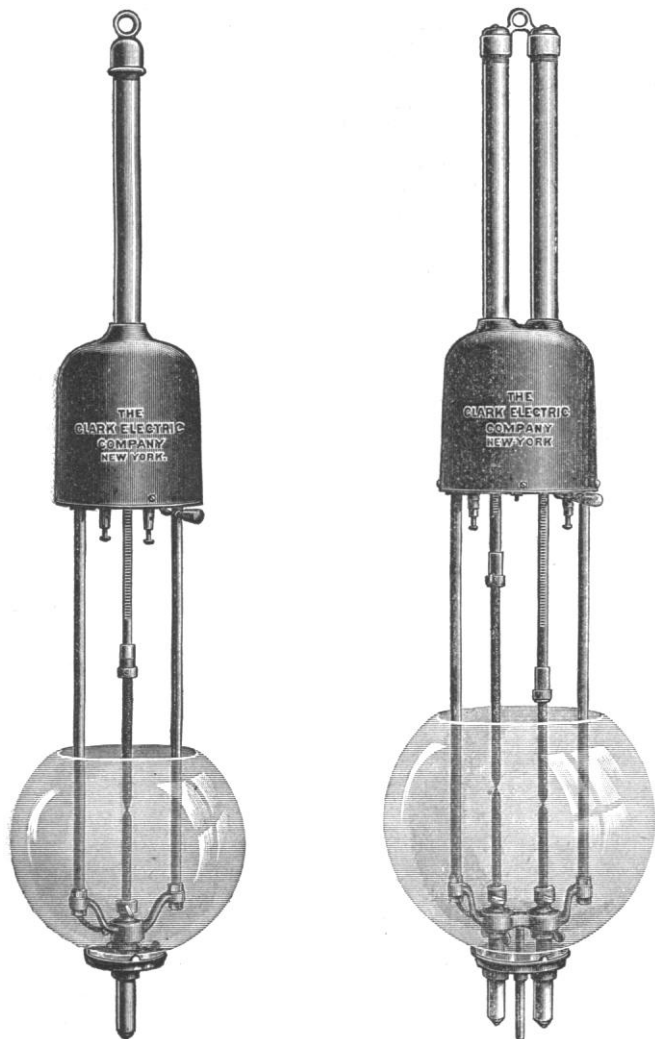
the cut. It consists of a solenoid, located in the main circuit, whose armature is attached to a lever. The other end of this lever carries a sliding contact piece, which slides over a number of sections or contacts of copper. A number of small spirals of german-silver wire are connected to these contacts, and arranged so as to form an adjustable shunt for the field-coil of the regulator, whose resistance in the 30-light regulator is only .15 of an ohm. By means of this arrangement, when the main current falls a trifle, the resistance of the german-silver coils is diminished, and a greater portion of the main current is shunted through them, instead of pass-



CLARK ELECTRIC COMPANY'S AUTOMATIC REGULATOR.

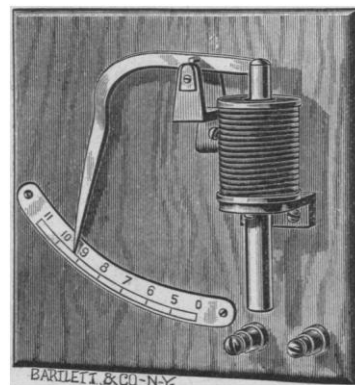
ing through the field-magnet coils. This, of course, causes a further reduction of the magnetism of the regulator field-magnets, the reverse action taking place when the current rises. It will be seen by this description that the regulating power depends upon the disturbance which is to be corrected; and the greater the disturbance, the greater is the regulating power; and, as it is not necessary that any thing should move, the regulating influence can be exercised to a great extent instantaneously, while the entire power of the regulator can be exerted in the fraction of a second that is required for the lever of the solenoid armature to move.

It is stated that the 30-light regulator exerts a counter electro-motive force under extreme variations of the main current, ranging from three or four volts to seven hundred volts, which is enough to control the dynamo under the most violent changes of load; and, as there is no train of gears nor ratchet movements to be put in



CLARK ELECTRIC COMPANY'S LAMPS.

line, passes through the coils of the regulator field-magnets, and thus supplies the field in which the regulator armature revolves. If from any cause the main current should increase in strength, it will at once cause an increase in the power of the field of the regulator, and an increase in the counter electro-motive force of its armature, which, being opposed to the exciting current of the dynamo field, reduces that current at once, and with it the strength of the magnetic field of the dynamo. This at once reduces the generating power of the dynamo, and brings the current back once more to its standard strength. If the strength of the main current should decrease for any reason, the opposite action will take place, the regulator field-magnet decreasing in strength, the counter electro-motive force of its armature diminishing, and the current through it and the field-magnets of the dynamo increasing, thus restoring the strength of the main current. There is another piece of apparatus included in the regulator, and shown at the back of



CLARK ELECTRIC COMPANY'S AMMETER.

motion, the regulation is accomplished in much less time than with any other device in use. The simple form of ammeter shown is supplied with each plant.

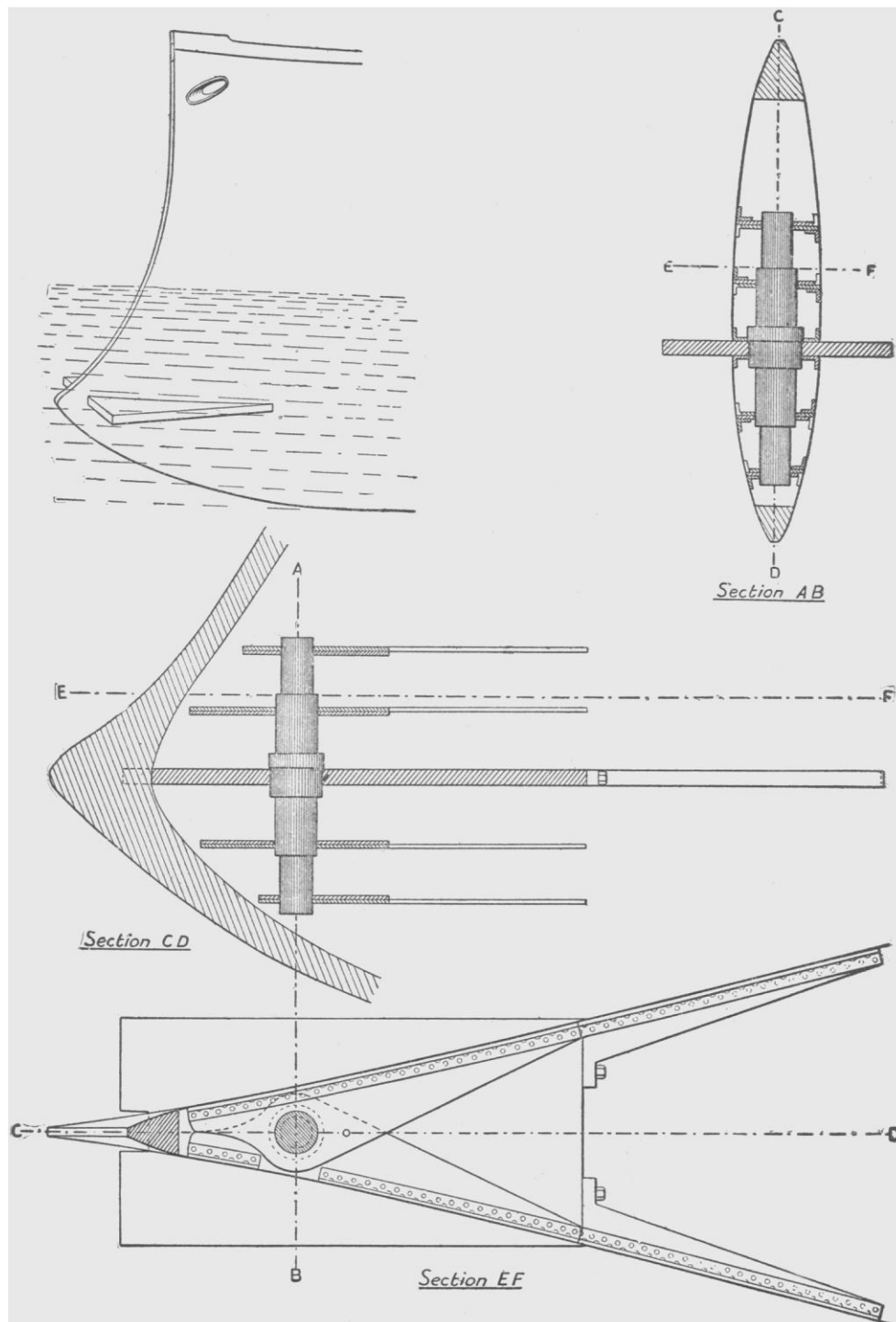
The arc-lamps shown in the illustrations are storm-proof, and do not require any hoods or other devices to protect them. The binding-posts are on the under side of the case, and will not become short-circuited by sleet or snow. The switch is also on the under side of the case, where it can be seen by the person operating it. These lamps have been exposed to the worst storms of the past winter; and, although at times completely covered with ice and snow, they have never failed to start when the current was turned on. The movement is claimed to be the most powerful ever put into a lamp. The moving parts are heavy in proportion, the carbon-holding rod alone weighing sixteen ounces.

THE WARD RAM FOR WAR-SHIPS.

IN a recent article on "Naval Wars of the Future," Admiral Porter, who is doubtless our highest authority on such matters, says, "Then there is the ram with which most of the sea-fights of the ancient Greeks were won. All foreign navies have vessels fitted as rams, which are expected to perform great service in

in 1878, by bad management, struck the 'Grosser Kurfurst' in the side and under water. The latter ship was sunk, and the former so damaged that she had great difficulty in getting into port."

In a similar irreverent way he says, "Neither fleet has what may properly be called 'rams:' both trust to the underwater 'snout,' which caused the sinking of the 'Grosser Kurfurst' and the disabling of the 'König Wilhelm.'" He also puts in the mouth of a



THE WARD RAM FOR WAR-SHIPS.

time of war. The 'ram' is simply an elongation of the bow under water; and although, no doubt, a vessel so fitted would inflict great injury on an enemy by running into her, she would be liable to injure herself quite as much, and go to the bottom with her foe. No modern rams have been tried in war, and ships so constructed will most likely be failures. In proof of this, take the case of the armor-clad frigate 'König Wilhelm,' of the German Navy, which

supposed English naval officer the saying, "Why have not the admiralty built proper rams, for those are the largest kind of projectiles?"

This description of a "proper ram" is certainly correct, for the blow given by a ship weighing, say, five thousand tons, moving at even as slow a rate as twelve miles per hour, would have many times the force of the heaviest projectile from the largest ordnance

ever constructed. The method of utilizing this force for the destruction of an enemy's ship, by vessels as now built, is to seize the opportunity when the intended victim is aground, at anchor, or in some way not in motion, and then to strike her as nearly at right angles to the exposed side as possible. This, of course, causes the complete stoppage of the attacking vessel, after which the engines are to be reversed, and the ram released. If the blow is given at an acute angle, or the attacked vessel is in rapid motion across the line of attack, the wrenching force produced would be perhaps more dangerous to the giver than to the receiver, owing to the lack of lateral strength in the form of ram as now universally built.

The consequence of this well-known lateral weakness of the regulation ram is, that all naval officers share Admiral Porter's opinion that no ship has yet been constructed that would serve the purpose of a ram; and they recognize the fact that the cases are few and far between in which a commander would be justified in risking his ship and his reputation in what he would himself feel to be a most reckless form of attack.

In view of this well-known idea, it seems strange that the form of ram shown in our illustration has not long ere this forced itself into use, as the thing, when once seen, looks too obvious and simple not to have come forward to fill the acknowledged want.

With a ram formed as this one is, the most advantageous angle of attack is precisely that which would be the most dangerous with the usual pattern, or, say, about twelve degrees. Every sailor knows how handily he can lay his ship alongside of a wharf or another vessel in such a manner as to foul his anchor when it is hanging at the bow, and this is the manœuvre by which he can use this ram with the best effect. The corner of the heavy iron plate will, as it touches the enemy's side, enter it with ease as far as the projection from the side of the bow will allow, and will cut a long furrow, plough-like, under the water-line. This attack does not necessitate any stoppage of the ship which acts on the offensive, as is the case where the blow is given "end on," which is an advantage of great moment in a strong current, a narrow passage, or when crowded by hostile or friendly vessels.

Having delivered her blow in passing, she is at once on her course again, and ready for whatever is required by the exigencies of the engagement.

The ram here illustrated, for use on war-vessels, is the invention of Mr. John F. Ward, M.Am.Soc.C.E., of Jersey City, N.J. Ships' rams, as usually constructed, present a sharp vertical cutting edge with comparatively little horizontal width. Such a ram, by striking squarely the side of an enemy's ship, may doubtless inflict much damage; but there is also great danger of wrenching off the ram of the attacking ship, by reason of a glancing blow or the swinging action of a strong current, or of so straining the frame of the attacking vessel that the ram would be practically valueless for further service.

The present device is intended to overcome the inherent disadvantages of the older form, and it accomplishes this end by a departure from former practice as radical as it is simple. Instead of a vertical plane of attack, we have here a horizontal ram, with projecting ends extending transversely through the bows of the war-ship, and presenting on either side of the stem an attacking angle of strong and heavy iron plate, so located as to strike below the water-line, and to be effective at almost any angle of approach. The most dangerous blow of all to an enemy with this ram would probably be an almost parallel glancing attack, which would tear a long, narrow path through the plating of the enemy's ship, and rupture any frame in the track of the ram. A hole of this nature would be most difficult to stop, and would to a considerable extent cancel the advantages of water-tight compartments in a war-vessel.

The drawings show the ram as arranged in the bow of the ship, though of course this arrangement might be modified at the will of the naval constructor, and in accordance with the type of vessel upon which it is to be used. The plate as shown here is about 6 inches thick, and about 8 feet wide and 16 feet long. Through the forward half of this plate passes a steel shaft about 24 inches in diameter, which is further braced 2 feet and 4 feet above and below the main plate by other stiffening plates, about $1\frac{1}{2}$ inches thick, strongly secured to the sides of the ship by angle-iron; and

the main plate is also in like manner connected with the ship's sides. The purpose of this steel shaft and the supplementary plates is to transmit the strains coming upon the angle of attack of the main plate to as great a surface as possible in the bow of the ship. In the plan shown, this surface distribution amounts to about 269 square feet.

The plan or "Section E F" is proposed for the adaptation of this ram to a war-ship already built, in which the difficulty of adjusting a large single plate to the position required for the shaft is overcome by making the plate in pairs. This plan also shows heavy bars or brackets in the rear of the ram-plate, for further connecting it with the ship's side, and transmitting strain from the ram to the ship.

SANITARY CEILINGS AND WALLS.¹

MUCH has been done by the sanitarians of the country, and especially the Board of Health of this State, to try to enlighten the people sufficiently in regard to the unsanitary nature of the prevailing modes of coating, or recoating and ornamenting, the ceilings and walls of rooms for domestic habitation; yet much remains to be done in this direction. The reason is, no doubt, that those who strongly condemned the prevailing modes offered no relief, gave no way of any kind by which the people could even plainly cover their ceilings and walls. Professor R. C. Kedzie, in his lectures when president of the State Board of Health some years ago, advised his audience to forego the pleasure of decorated walls, or to simply whitewash them with lime, rather than stop what he terms "wall-respiration" by sealing or strangling the pores in the plaster with paste and paper, kalsomine, or paint. He illustrated to his audience, by means of blowpipes filled with dried mortar, and some coated with paper, others with paint and kalsomine, how readily air passes through walls of ordinary mortar and with stucco finish (the so-called hard finish), or when simply whitewashed, and how this "wall-respiration" was prevented by all the other modes; and under the professor's directions the State published a book entitled "Shadows from the Walls of Death," and placed copies of it in all the public libraries, with this Bible inscription on its cover: "And behold if the plague be in the walls of the house with hollow streaks, greenish or reddish, then the priest shall go out of the house to the door of the house, and shut up the house seven days. . . . And he shall cause the house to be scraped within round about, and they shall pour out the dust that they scrape off without the city into an unclean place."

This book contains seventy-five specimens of arsenical wall-papers, all gathered from the paper-stores of Michigan, and gives authenticated cases of poisoning from many of these papers; and on all of them arsenic was found in the colors, not only green, but nearly all colors and tints, and some also in making the finish or lustre. A year or two ago the sanitarians of Massachusetts made quite an effort in this direction, introducing a bill in the Legislature to prohibit the sale of such paper; but the paper-men used their influence against it, sent representatives to the Legislature, who claimed or pretended to prove that there was no foundation to the claims made by the sanitarians, and the bill was defeated.

Now, while there are many cases where the people have suffered from arsenical wall-paper, I am fully satisfied from a thorough study of this subject of wall-coatings constantly for fifteen years, and quite a portion of the time applying the same, removing old papers and kalsomine, and from talking with sanitarians and scientists on the subject, that a greater amount of sickness is caused from other conditions of the walls, and conditions that generally prevail, and in nearly every house, than from the very dangerous arsenical wall-papers; and I believe in many of the cases cited, where it was proven that the patients had suffered in rooms coated with paper which proved on examination to contain arsenic, that other conditions connected with the same paper and walls contributed largely to the troubles.

Before going further, I wish to explain that I will show, before the completion of this paper, how people may decorate their rooms in a way that is approved of by the sanitarians who had before condemned every thing used for the purpose, except lime white-

¹ Abstract of a paper read by M. B. Church of Grand Rapids at a sanitary convention at Hastings, Mich., Dec. 4, 1888.

wash. By the method I shall give, and illustrate with specimens I have with me, I will show that walls can be ornamented with any degree of elaboration desired, or plain, and at much less expense than with any of the old modes. The article has been sold for some years, and I find it in use by most of the sanitarians I talk with on this subject.

We will now consider the prevailing modes a little further. It is well known that most houses are papered, and that care has been taken in most cases to choose dark papers with many figures, for the same reason that a workman prefers a colored shirt; and I think I do not overstate when I say that seven-eighths of the buildings papered are papered more than once, that is, that two or more layers have been pasted on, one upon another, and that a large portion of these, say one-half of them at least, have from six to a dozen layers on. It seems as though people should only need to be reminded of this nasty practice, saying nothing about its effect upon health, to induce them to at least remove the old coats of paper and paste, after they have become filled with filth, before applying new coats. It is not necessary for me to explain, what every person knows, that flour-paste will soon mould; that it is a ready absorbent of moisture and disease germs; also that paper is a very ready absorbent. They may not be aware, however, that the coloring and bronzes, which are pulverized metals, brasses, etc., are only temporarily held upon the face of the paper with animal matter (glue), that soon decays; and glue is the greatest absorbent of moisture, and the natural culture-ground for the germs. If these little pests get sufficient heat while there, they will flourish (and the rooms are sometimes very warm above the lines of the doors and windows, with a moderate fire); and where repeated coats of this paste, paper, and glue are applied, from which outdoor air with its purifying effects is excluded by the respiring pores being sealed or strangled, the danger is much greater. The glue soon rots sufficiently to allow the air or any friction to remove small particles to which these germs have attached themselves to float about the room unseen, until they lodge in the system of some unsuspecting victim, whose physical condition is such that they take effect; then they still have the little particles of fertilizer with them to help give them a start on their deadly mission.

Dr. Henry B. Baker, secretary of our State Board of Health, has shown us many different kinds of these little bacilli, some of which he had printed cuts of, taken from photographs. He explained how, by the aid of the latest improved microscopical instruments, it was possible to distinguish these pests one from the other, — those causing typhoid-fever from those causing consumption, etc., — and explained how their growth can be watched, where they have been caught on bits of moistened glue; how they must come to a certain state of maturity before they are dangerous; and that they do not then take effect unless the lungs, or other parts of the body they strike, are in such a weakened or inflamed condition that nature cannot expel them.

The fact that these conditions do not always cause serious mischief; that some people do live in rooms the walls of which are in a very unsanitary condition, and probably filled with vermin, contagion, and filth, without apparent or immediate injury to them, — causes many to think that these claims made by the sanitarians are without foundation, or not of vital importance, while they probably suffer from these causes, more or less, which they attribute to having taken cold, or to having committed some impropriety in eating or overwork; and when they become very sick, they flee to another climate, if they are well-to-do, where they often recover, probably by getting in a room not in so bad a condition, and return home to have the old trouble return, and continue to breathe this slow death-dealing matter, to save the expense of removing the filth from the walls, or because they do not believe or have not heard the warning.

Another unsanitary practice is what is known as kalsomining, which is the covering of ceilings and walls with coats of inert powders and colors, temporarily fastened to the wall with the same kind of animal matter used in coating wall-papers. This glue coat also strangles the wall, but is not so bad as wall-paper, seldom contains as much poison, and does not admit of coating so many times without falling off, though there is more glue in it (and it rots sooner) to be set afloat. Another bad practice is the painting

of walls with oil-paint, composed of lead, zinc, and colors mixed with oils. This seals the pores of the walls more effectually than does the kalsomine or wall-paper, but remains longer before it decays sufficiently for small particles of the lead to be dislodged, though it always gives off a slight smell of paint, and when the room has been closed it always has a stuffy or stifled smell, something as do also all rooms covered with many layers of wall-paper. The painted walls can be washed; but, even if washed frequently, the fine cracks always found in walls will be washed full of filth and the germs of disease, if any, in the room.

The article or process I have referred to as being adapted to making a clean, cheap, and sanitary coat for walls, is composed mainly of sulphate of lime, known as gypsum or alabaster, which has been calcined by subjecting it to great heat in retorts, or boiled in large kettles until its water of crystallization is driven off, so that, when water is added to it again, it will again take up its original water of crystallization. This process is called "setting," and takes place naturally in about seven or eight minutes, reforming a stone much like the original stone in the quarry, but more porous. This rock in the natural state, as we grind it at Grand Rapids for use on farm-crops, contains from 35 to 40 per cent of sulphuric acid. The better grades of this rock, after calcining, are so manipulated in making this article for walls, which is known as alabastine, that this setting process is retarded for a number of hours, adapting the plastic, or liquid, to being spread upon walls with a brush in a very thin condition; so that fifty coats, as applied to walls from time to time, form a hard, porous shell not thicker than card-paper; and the coat is not of a glue or paste nature, the size and admixtures used to retard the setting having been absorbed by the base in taking up its water in setting. There is only one other article on the market that is claimed to produce the effects produced by alabastine, and that is called "anti-kalsomine and plastic." These articles are made in many shades, ready for the brush, by adding water. Many kalsomines are put up and sold in the same form, but are dependent on glue to hold them to the walls.

The late Richard A. Proctor explained, in one of his last contributions to the *Inter-Ocean*, how much moisture, in tons, would be thrown off by respiration from an audience of a certain size in a given number of hours. That this moisture is condensed mainly on the walls of the room, is easily seen by rubbing the finger on almost any painted wall, where the moisture does not penetrate readily, but is on the surface, as is often seen on windows. This is sometimes seen on paper and kalsomine; but they absorb moisture so quickly that it does not show on the surface, though they attract more than the paint. That this moisture carries contamination with it, is certain; also that it rots such materials. The paint, as explained before, is not quickly rotted, but oxidizes slowly, so that the effect from it is not so bad as from paper or kalsomine. That air passes through walls is proven by the dust-marks seen on plastered walls, or those that have been only whitewashed or alabastined, indicating the spaces between the lathing caused by the dust being filtered from the air more between the laths than on them.

It should be borne in mind that it is not claimed that the amount of air that will pass through walls the pores of which have not been strangled, cuts any considerable figure in furnishing air to the inmates of the room, but that this purifying of the ceilings and walls takes place by the constant passing of pure air through and through them, oxidizing, or practically burning, these little germs, as it is well known pure air will do. In one of Professor Kedzie's lectures, he cites experiments made by Professors Marker and Shultz, in which they prove that a difference of 20 degrees in temperature on either side of a wall of brick and mortar would cause 8 cubic feet of air to pass through each yard of such wall every hour.

I have some samples here of the sanitary coating I have referred to, applied on panels, showing sections of quite elaborate designs, as well as plain work. I will explain them. This panel I now show you is finished mainly in what is called relief-work. This corrugated work on the lower portion is done by applying the alabastine thick; then a coarse graining-comb was drawn through it in various shapes, before it set. The colors having been ground

in and chemically united, it forms a solid tint all the way through the mass; so that slight abrasions, like cutting it off with a knife, still show the same color. Half of this combing has been varnished, which you see produces a somewhat darker and a satin or leather like effect. This varnished work is washable, and is as easily cleaned as any varnish. The centre is simply bronze in the varnish. The upper portion, or decorated frieze, has less body on, and was made by dipping each corner of a wide brush in the two different tints, which easily produced the blended or soft shaded effect. The ribbon was put on with a thin coat of the material through a paper stencil, and the vine in the same way. The flowers were put on with oil-color. The other side has at the bottom what is called heavy stippling, and a slight representation of bas-relief, that is sunk below the surface. The frieze above is ornamented in what is called flat relief, to imitate solid or high relief. The blended grounds of the frieze have been stippled; that is, pounced with the ends of a brush or with a covered block, to give it a slightly roughened effect. These effects are admitted, even by paper-dealers, to be finer than it is possible to produce with the finest papers, and will make a blended tint or whitened wall, on which borders, leaves, etc., can be applied with stencils, and keep within bounds of the expense of papering.

Here we have a plain tinting on large sheets of paper with what is called a combination stencil border. The background of the border was put on with one paper stencil, and the other or main stencil was used over it. This plain tint has the same stencil border on with one tint, which can be done as easily and as cheaply as the cheapest wall-papering. Here we represent a wall blended from top to bottom in two shades. The manufacturers will show any painter so that he can do this blending easily, and usually with one coat. This and the relief-work is done with a late make of this material, made for this kind of work. When it is necessary to renew alabastine, you have no old paper or kalsomine to take off, but simply to repeat the process. I should add, it will be seen, as this forms a stone cement that hardens with age, it precludes any possibility of the colors being liberated to float around the room, as they do from paper and kalsomine, even if they were poisonous. Some claim that a wall should be impervious instead of porous. This might do very well with perfect ventilation, if it were possible to have such a wall; but one partially so is only strangled, and gives a better chance for matter behind to ferment and the germs to propagate. Now, we show here sections of this work varnished, which is nearer impervious than any wall I have ever seen, as the varnish combines with the outer part of the porous stone surface by penetrating into it; also there is nothing behind but the pure stone cement of a cold nature, the air has access to the back of the varnish, and there is absolutely no chance behind for fermentation or decay. However, for plain work, it is as well, and as cheap in the end, without varnish (as it will stand some cleaning, with care, to remove spots); and the surface can be recoated almost as cheaply as the wall can be washed. Then you have a choice of new tints; and any broken places in the plaster, which always occur, are filled and cemented by brushing on this cement again with a brush.

NOTES AND NEWS.

THE senior class this year at Harvard numbers 210, and is the smallest class in the university.

— It looks as though California would have the largest crop of grapes in the history of the State. Manager Clarence Wetmore of the Viticultural Commission says, "There are some localities where, from present appearances, the Zinfandel will not yield as heavy as last year. White grapes in most localities are settling for a full crop, and, if nothing unfavorable happens from now till vintage time, we ought to produce from 20,000,000 to 35,000,000 gallons of wine. The raisin-crop will be a heavy one, even with the loss of several thousand acres of vines in Los Angeles County by disease. The State will probably produce 1,000,000 boxes. The outlook for the wine-market is not very good. At least half of the 1888 vintage is in the hands of producers, who will not sell at the ruling low prices. On this account there will not be sufficient cooperage to handle all the wine grapes that will be thrown on

the market. As a consequence, most varieties of wine grapes will bring low figures. There is great need of distilleries in this State to convert low-priced grapes into brandy, for which there is a steady demand."

— Below is the speech in which Professor Taylor of the University of Edinburgh proposed the name of Professor Whitney of Yale for the honorary degree of LL.D., which was conferred: "I have now to ask your lordship to confer the degree in absence on William Dwight Whitney, professor of Sanscrit and comparative philology in Yale College. After studying Sanscrit at Berlin and Tübingen for three years, Professor Whitney was appointed to the chair of Sanscrit and comparative philology in Yale College in 1854. In 1856, in conjunction with Professor Von Roth, he edited the Sanscrit text of the Atharva-Veda. During the last thirty years he has been one of the master spirits of the American Oriental Society, having been for several years its corresponding secretary, and latterly its president; and in the journal of that society he has published a translation of an astronomical work termed the "Surya Siddharta," the text and a translation of two Vedic grammatical works, an Index Verborum to the Atharva-Veda, and other important works. He is also the author of an excellent Sanscrit grammar, treating of the language in its historical development, and supplemented by an important catalogue of all genuine Sanscrit roots. Among his other works must be mentioned the "Language and the Study of Languages," the "Life and Growth of Language," the "Essentials of English Grammar," and his collected "Oriental and Linguistic Studies." Nor has he disdained less recondite subjects; for he has also published a German grammar and German reader, two admirable works of their kind. It is mainly to Professor Whitney's unwearied labors as a teacher and an author that America is indebted for the flourishing school of Oriental philology, in which he is *facile princeps*, and on those grounds he was invited to become one of our tercentenary honorary graduates. I have now the honor of requesting that the degree be conferred upon him in absence."

— At the Eiffel Tower, on May 29, Thomas E. Brown, jun., the engineer of Otis Brothers & Co., subjected the Otis lift to a final test before handing it over for public use. The lift, the car of which consists of two compartments, one above the other, weighs 11,000 kilos (24,000 pounds), and, loaded with 3,000 kilos (7,000 pounds) of lead,—that is to say, weighing 14,000 kilos (31,000 pounds),—was raised to a considerable height. There, according to *The Engineer*, it was fastened with ordinary ropes, and, this done, it was detached from the cables of steel wire with which it is worked. What was to be done was to cut the ropes, and allow the lift to fall, so as to ascertain whether, if the steel cables were to give way, the brakes would work properly and support the lift. Two carpenters, armed with great hatchets, had ascended to the lift, and were ready to cut the cables. At a given signal a blow cut the rope. The enormous machine began to fall. Every one was startled; but in its downward course the lift began to move more slowly, it swayed for a moment from left to right, stuck on the brake, and stopped. There was a general cheering. Not a pane of glass in the lift had been broken or cracked, and the car stopped without shock at a height of ten metres (33 feet) above the ground.

— In the Pearson process of manufacturing aluminium, as stated in the *Journal of the Society of Chemical Industry*, one hundred parts by weight of cryolite are mixed with fifty parts of bauxite, kaolin, or aluminium hydrate, fifty parts of calcium chloride, oxide, or carbonate, and fifty parts of coke or anthracite, all being in powder. The resulting mass is heated to incipient fusion in a furnace or in a crucible made of, containing, or lined with, carbon, in which case, the carbon may be omitted from the mixture. The heating is continued for two hours, at the end of which time it is alleged that the aluminium is reduced, and exists disseminated in minute globules throughout the mass. A mixture of twenty-five parts each of potassium and sodium chlorides is then added, and the temperature raised to bright redness: the aluminium collects at the bottom of the crucible. A better separation is, however, effected by powdering, washing, and drying the melt, and adding it to fused zinc, which alloys with the aluminium, and can afterwards

be removed by distillation. If copper be used instead of zinc in this process, aluminium bronze is obtained. Other fluxes than those mentioned may be employed.

— A submarine bridge is proposed between Sweden and Copenhagen by a Swedish engineer, Mr. Rudolph Littlejegrist. The distance, according to *The Engineering and Mining Journal*, is two and a half miles, and the proposed structure would join Elsinore to Helsingborg by a bridge made up of one hundred feet spans, carrying a single line of rails. It is to be submerged sufficiently to allow ships to pass over it. The bridge would be incased in a double tube, with an outer skin of iron and an inner one of steel, and the space between the shells filled with concrete. It is foreseen that the outer shell might rust away in time; but it is believed that the concrete would remain intact, and protect the steel. The piers would be ordinary caissons, filled with concrete, and placed one hundred feet apart. The tubes would rest on these piers, and the girders would take a bearing on blocks inside the tube immediately over the piers. The tube would be floated out in one hundred feet lengths and lowered to place, and a massive collar of concrete put over the joints. Pontoons, with legs at each corner, worked by hydraulic rams, so as to give a stable platform, would be used in sinking the tubes. The estimated cost of the submerged work is about \$3,500,000, not including the approaches.

— According to the *Moniteur de la Céramique et de la Verrerie*, a method of electroplating glass and porcelain has been devised by M. Hansen. The chief difficulty hitherto experienced has been to obtain a conducting surface which would not prevent the proper adherence of the metallic coating. M. Hansen uses chloride of gold or of platinum dissolved in sulphuric ether, to which sulphur dissolved in some heavy oil is added. This compound, after having been slightly heated, possesses sufficient consistency to allow of a film being laid on the glass with a brush. The object treated in this way is then moderately heated in a muffle until the sulphur and chlorine are completely volatilized, the gold or platinum adhering firmly to the surface. The best copper bath is two parts of sulphate of copper to three of distilled water. In silver-plating, seventeen parts of nitrate of silver and thirteen parts of cyanide of potassium, dissolved in three hundred parts of water, are used. For gold-plating, seven parts of gold are used, which are preferably dissolved in *aqua regia*, and precipitated by means of ammonia. This precipitate, while still wet, is then placed in a warm solution, consisting of nine parts of cyanide of potassium and ninety parts of water.

— We recently published an extract from *Engineering*, descriptive of the use of the water-jet in sinking the wooden piles used in the construction of the Calais harbor-works, in which the remark was made, "We believe [the water-jet] had never been previously used in this particular manner." In response to this, Mr. L. Y. Schermerhorn, in a letter to *The Engineering and Building Record*, says that in 1881 he compiled a paper giving, as far as known, the history of the water-jet as an aid in engineering construction, which was published by the Engineering Department of the United States Army. From this paper it is clearly established that the use of the water-jet in sinking both wooden bearing and sheet piles had been applied in this country long previous to 1877, the date of its use at Calais. In 1852, Lieut. George B. McClellan used the water-jet for sinking piles in the government wharf at Decrows Point, Matagorda Bay, Texas. In 1854, Lieut. W. H. Stevens made a similar use of the water-jet in sinking sheet and bearing piles in the construction of a jetty for the protection of Fort Livingston, La., and for the foundations for lighthouses in the vicinity. In 1862, Mr. J. W. Glenn placed five thousand wooden piles across the channel to Mobile harbor, to prevent the entrance of the Federal fleet, by pumping them down with a water-jet. In 1867-69, O. Chanute, chief engineer of the Kansas City Bridge, used the water-jet for sinking bearing piles. In 1868, T. J. Whitman, chief engineer of the St. Louis water-works, applied the water-jet for sinking sheet piles for the coffer-dam about the foundation of the engines. In 1872, Major P. C. Hains used the water-jet in sinking piles for lighthouse foundations. In 1873, C. C. Martin, superintending engineer New York and Brooklyn Bridge, sunk sheet piles by aid of the water-jet. From the foregoing, it is evident that the water-

jet had been used in this country by engineers for sinking bearing and sheet piles nearly a quarter of a century previous to its use at Calais.

— According to the *Japan Weekly Mail*, an earthquake of a most unusual character was recorded at 2h. 7m. 41s. P.M., on Thursday, April 18, in the Seismological Observatory of the Imperial University, Tokio. The peculiarity lies, not in its violence, but in the extreme slowness of its oscillations. The beginning of the shock had all the characteristics of the ordinary earthquake; but gradually the motion augmented, until at a certain stage of the shock it reached seventeen millimetres, but the ground swayed so gently that the house did not vibrate visibly, nor were the senses alive to it. It took from four to seven seconds to complete one oscillation, — a most unusual phenomenon, and one never before noted in the observatory. The motion was almost entirely confined to the horizontal plane, and mostly south to north, but there were a few vertical motions of equally slow periods. This state of things lasted for ten minutes thirty-six seconds. Professor West of the Engineering College observed the water in a small pond to oscillate gently from north to south. At one time the water-level fell about two inches on one side of the pond, and exposed the bank, while a few seconds later the water immersed it nearly to the same depth, exposing the opposite bank; and this process continued for a quarter of an hour. "Slow oscillations of this nature have been called 'earth-pulsations,' and these usually take place where there is a destructive earthquake or a submarine disturbance going on at a great distance. Earth-pulsations are known to have caused slow oscillations of the water in lakes. From this fact it may not be unreasonable to conjecture that a terrestrial or submarine agitation of unusual magnitude has taken place somewhere. The authorities of the Science College have sent to the Hydrographical Bureau of the Naval Department, asking for information as to the state of the tide and seas. It may be as well to remark that it is not certain whether the maximum motion of seventeen millimetres, as given by the seismograph, is perfectly accurate, as it is very difficult to measure slow oscillation like this with absolute certainty." It is now known as a fact that Vries Island, outside Yokohama Bay, and possibly sixty miles off, was in a state of violent volcanic eruption.

— Naphtha is now much used as fuel in middle Russia. Last year, 880,000 tons of it were sent up the Volga for fuel purposes; and it is expected that the export for the same purpose will this year reach no less than one million tons.

— The province of St. Petersburg is very rich in marshes covered with a thick carpet of vegetation, which conceals water to the depth of several feet, — sometimes twenty-five feet and more. Small lakes and branches of rivers are continually being transformed into such marshes; and M. Tanfilieff, who has studied the way in which the transformation goes on, comes to the following conclusions (*Mémoires of the St. Petersburg Society of Naturalists*, vol. xix.), which are given in *Nature*: "The pioneers of the transformation of a lake into a marsh invariably are flowering plants, such as *Menyanthes*, *Comarum*, *Cicuta*, *Equisetum*, *Carices*, and the like. Their roots and underground stems make a thickly woven floating carpet, which soon totally conceals the water. The *Sphagnum* invades this floating carpet, while the water beneath becomes filled with *débris* of decaying plants, transformed later on into peat-bog. In shallow basins the transformation goes on at a much speedier rate, as their bottoms are invaded by plants, like *Phragmites* and *Scirpus lacustris*, which reach a considerable height, and thus supply, after their decay, a good deal of additional material for the filling-up of the basin. A mass of smaller plants, such as *Lemna*, *Hydrocharis*, *Callitriche*, *Utricularia*, *Hyphnum fluitans*, and several others, usually grow also amidst the rushes. Of course, the streamlets which flow into the basin contribute also to fill it up by bringing in sand and loam. As soon as the floating carpet has reached a certain thickness, and the *Sphagnum* has still more increased its bulk, various plants, such as *Drosera*, *Vaccinium*, *Eriophorum*, the dwarf birch, and other bushes, begin to grow upon it, although the space beneath still remains filled with water. As the *Sphagnum* does not grow upon ponds containing a chalky water, its place in such ponds is mostly taken by the

Hypnum; and in these cases a variety of other plants, such as *Typha*, *Stratotes*, *Butomus*, *Ranunculus divaricatus*, and *Chara fragilis*, make their appearance. As to the *Sphagnum*, it invades wet meadows as well."

— Dr. F. Nansen, at a recent meeting of the Geographical Society of Copenhagen, delivered an interesting lecture, in which he sketched the scientific results of his Greenland expedition. The ice on the east coast, he said, is difficult to pass, because it is intersected by deep fissures. The opinion that the summits which emerge from the inland ice make travelling difficult, must be abandoned. On the contrary, they make the ice more level, and retard its motion. Future expeditions will have to take advantage of this fact. On the plateau the ice is similar to a shining sea. Its surface is covered with loose snow, which is kept in motion by a continuous wind. In the interior there is nothing but ice and snow. There is no point on which the eye can rest, and the traveller has to be guided by the compass, as on the open sea. The snow does not melt, and the snow-fall is very heavy, while there is no rain. It is impossible to cross the interior without the use of snow-shoes. Reindeer might be used, but the difficulty of carrying a sufficient amount of provisions would be enormous. Notwithstanding the low temperature and the heavy snow-falls, the thickness of the ice does not increase, as the glaciers carry enormous quantities into the sea, and as the heat of the interior of the earth is not without influence upon the ice-cap. The temperature of the inland ice increases with increasing depth, and at the point where it rests on the rocks it is undoubtedly melting. The cold on the plateau is intense: the breath of the travellers froze as it left their mouths. On the whole, Dr. Nansen said, the scientific results of the expedition may not have been as great as many had expected, but his expedition had shown that the ice is not impassable, and future journeys would give better results.

— Columbia College makes an announcement of the course in electrical engineering in the School of Mines department. The officers of instruction and government, besides Henry Drisler, LL.D., acting president of Columbia College, are, William P. Trowbridge, Ph.D., LL.D., professor of engineering; Francis B. Crocker, E.M., instructor in electrical engineering; Michael Pupin, A.B., assistant teacher in electrical engineering; and George F. Fisher, registrar. This course in electrical engineering has been established in the School of Mines, open to graduates of that school and of other institutions of like grade and standing. The full course will occupy two years: there is a partial course which can be completed in one year. The course of instruction will comprise: 1. General principles of electricity; 2. Principal phenomena of electricity; 3. Simple applications of electricity; 4. Theory of the dynamo and motor, dynamo and motor regulation, transmission and distribution of power, electric-railway systems and locomotives, telegraph systems (duplex, multiplex, printing, autographic, and submarine), telephone systems, electro-chemistry (including theory of primary and secondary batteries), electro-metallurgy (plating, reduction, separation of metals), electricity applied to mining, torpedoes (stationary and movable). In addition to the lectures and study of standard electrical text-books, there will be examinations and explanations of practical electrical machines and models; examinations and reports of visits to electrical stations, factories, and plants; workshop practice in actual construction of electrical apparatus and machines; designing and drawing of electrical machines and apparatus for construction; design, drawing, and preparing specifications for electrical plants; practical work in setting up and use of instruments for testing; a study of the mathematical relations of electricity, light, heat, magnetism, and mechanical energy; the mathematical determination of electrical laws, units, and constants; and the mathematical theory of flow and action of intermittent and alternating currents. Graduates of the School of Mines, and of other institutions of like grade and standing, will be admitted to the course without examination; but, in cases where there may be any doubt of the proficiency of such graduates, they may be required to pass such examinations as shall be prescribed by the faculty. For particulars as to the course of instruction, etc., in electrical engineering, apply to Professor W. P. Trowbridge, and for general information and circulars, to George F. Fisher, both at

the School of Mines, Columbia College, 49th Street, corner Fourth Avenue, New York.

— This year, according to the *Botanical Gazette*, is the centennial of the introduction of the chrysanthemum into Europe, and of the dahlia into England.

— In a communication to the North London Photographic Society, Mr. J. Jackson stated that he had succeeded in developing gelatino-bromide paper in a dark-room lighted by a gas-jet whose only protection was a globe of ground-glass covered with a thin sheet of yellow paper. Although we should not advise a repetition of this experiment, we desire to call the attention of our readers to it, because it is instructive in showing how unnecessary it is to try the eyes with deep ruby-colored light in the developing-room. It is in this point — namely, the practicability of safely using yellow rather than red light — that the statement of Mr. Jackson is valuable. He claims that his success was largely due to the amount of actinic light kept back by the ground-glass. This is also quite true; and the estimate has been made that ground-glass absorbs fully one-tenth of the light passing through it. The use of yellow light in the developing-room, when properly managed, is not only safe, but actually better than red light. The sensitive-film need not be exposed to the yellow light for any long time, and, if necessary, the developing-pan may be covered with some opaque substance.

— The question is sometimes asked, "What forms of vessel are best for washing paper prints, and of what material is it advisable to make them?" For amateurs who work on a small scale, and who can give constant attention to their prints, an ordinary deep porcelain tray of large size is as good as any thing. The water may be admitted through a rubber tube long enough to curl on the bottom, and thus give a circular impulse to the flow of water and at the same time keep the prints from sinking to the bottom. A stout glass rod (or, better, a slip cut from a long piece of glass) is laid across each corner of the tray, so that when the prints are floated upward they may not escape. Neither iron nor tin should ever be used. Zinc, however, may be made to serve a useful purpose for the final washings of silver prints, if a good coating of some waterproof varnish be first applied. Black asphaltum or heavy shellac repeatedly laid on would answer. Wood is a safe material so far as any effect upon the prints is concerned. It should be well dried before being made up, and plenty of pure paraffine melted into its pores by means of a hot flat-iron. The only trouble with these wooden trays is that they generally split apart or open at the seams if laid away out of use for a time.

— Madison University, Hamilton, N.Y., will be known, as soon as legal preliminaries can be effected, as Colgate University. The change found many advocates, and naturally some opponents; but at a joint session of the boards of the university and executive society a free and satisfactory discussion of the reasons for the change showed a vast preponderance of opinion in favor of it. The move for selecting the name "Colgate" is to recognize the eminent services of the Colgate family of New York of the generations past and present, in behalf of the university and its interests. The reasons for dropping "Madison" are the many serious and annoying mistakes made by confounding the New York institution with the University of Wisconsin at Madison, frequently spoken of as "Madison University."

— Among recent deaths of English scientific men reported in *Nature*, we note that of Mr. John Frederick La Trobe Bateman, F.R.S., who died at Moor Park, Farnham, at the age of seventy-nine, after a severe illness (Mr. Bateman was well known as the engineer who supplied Glasgow with water from Loch Katrine); of Eugen Ferdinand von Homeyer, the eminent ornithologist, who was born at Herdin, near Anklam, in 1809, and died at Stolp, in Prussia, on June 1 (he had been president of the Ornithological Society at Berlin, was the author of several works, and possessed the largest existing collection of European birds)* of Dr. Bernhard Weissenborn, the zoölogist to the German Kamerun Expedition, from a fever contracted through the hardships of the work and the bad climate; and of Dr. C. Jessen, the naturalist, formerly professor at Greifswald, and lately at the Berlin University.

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CONTENTS:

A GOOD RECORD FROM ATLANTIC CITY.....	493	ETHNOLOGY.	
THE CLARK ELECTRIC COMPANY'S APPARATUS.....	494	Marriage Ceremonies of the Bilqula	505
THE WARD RAM FOR WAR-SHIPS.....	496	HEALTH MATTERS.	
SANITARY CEILINGS AND WALLS.....	497	American Public Health Association	505
NOTES AND NEWS.....	499	Ice-Water.....	506
EDITORIAL.....	502	The Mortality among Nurses.....	506
River-Pollution in Connecticut.		Underground Water and Bacteria..	506
DR. H. MEYER ON STANLEY'S EXPEDITION.....	502	The Fly as a Disease-Carrier.....	506
THE LAKES OF THE SAN JOAQUIN VALLEY.....	503	BOOK-REVIEWS.	
THE CAMERA ABROAD		Principles of the History of Language.....	506
Ellerslie Wallace	504	Seraphita.....	507
PREPARATION AND PROPERTIES OF MANGANESE.....	504	La Société Française au Dix-septième Siècle.....	507
		AMONG THE PUBLISHERS.....	507

TWO YEARS AGO the Connecticut Legislature very commendably appropriated five thousand dollars for the investigation of the pollution of streams, intrusting the work to the State Board of Health. The results of the investigations, carried on by Dr. S. W. Williston, have shown the rapid and alarming increase of river-contamination, a half-dozen of the rivers already being very greatly or excessively polluted. The Naugatuck, for instance, — a stream upon which are situated many of the large metal-manufactories of the State, and with a summer-weather flow of about ten million cubic feet at its mouth, — receives not less than twenty-five hundred tons of manufactory refuse annually, in addition to the sewage of about seventeen thousand people. At the last session of the Legislature a like appropriation was intrusted to the Board of Health for the investigation of the potable waters of the State, which investigation will be carried on, under the direction of the secretary, Dr. C. A. Lindsley, by Drs. H. E. Smith, T. G. Lee, and S. W. Williston, of the Medical Department of Yale University, and will include the monthly examination of potable waters, chemically, bacteriologically, and microscopically, on essentially the same plan as that so extensively and thoroughly pursued by Professors Drown and Sedgwick for the Massachusetts Board of Health. The results of the investigations cannot help but be valuable, as hitherto scarcely any attention has been given to the subject in the State, and many of the waters used for domestic purposes are at times confessedly bad.

DR. H. MEYER ON STANLEY'S EXPEDITION.

DR. H. MEYER, at a recent meeting of the Berlin Geographical Society, delivered an interesting lecture on Stanley's expedition. We learn from this experienced traveller that the region traversed by Stanley was, up to this date, totally unknown. From his letter the general outlines of its topography have become known. The upper course of the Aruvimi is not the Nepoko, as Junker was inclined to think, but its source is in the Speke Mountains, north-west of Lake Albert Nyanza, in which the source of the Welle-Obangi is also situated. The length of the river is approximately 1,000 miles. Whether the Muta Nzige belongs to its system or not, is doubtful. Stanley assumes that the latter belongs to the Kongo basin, as the southern affluent of the Albert Nyanza, the Semliki or Kakibi, is said not to come from the Muta Nzige, but to rise in the mountains of Ruwenzori, which were discovered by Stanley, and are described as a high snow-covered mountain about fifty miles south of Lake Albert. It may be that it is the same as the Gambaragara Mountains. If Stanley's observations, according to which the level of the Muta Nzige is lower than that of the Victoria Nyanza, be correct, it cannot belong to the system of that lake.

From the Kongo to the Albert Nyanza the country rises gradually, and attains an altitude of 5,200 feet close to the lake. There is a sudden fall to the lake, which is 2,900 feet high; and the high range of mountains which is seen on the west side of the lake is nothing else than the eastern slope of this plateau. Stanley found the level of the Albert Nyanza considerably lower than at his first visit, and expresses his opinion that this fact is a consequence of the rapid erosion of the Nile at Wadelai, and the deepening of the outlet of the lake. It is more probable that this lowering of the lake-level is due to a change of climate, as all the lakes of Central Africa show the same phenomenon.

Stanley describes the whole region between the Kongo and the Albert Nyanza as covered with an enormous forest 250,000 square miles in extent. This does not appear probable, as Stanley travelled most of the time close to a great river, and met with open country as soon as he left its course. On his former journeys he has also concluded erroneously, from the appearance of the banks of the Kongo, that the whole region is covered with dense forests, while it is to a great extent open land.

A description of the vegetation of this country from so excellent an observer as Dr. Junker, who reached the Nepoko coming from the north in 1882, is of interest. He says, "Close to the river, on the walls of its deep valley, and frequently beyond the upper edge of the latter, dense forests are found. Scarcely a ray of the sun penetrates these dark masses of trees. The woods are sometimes as wide as one or two miles. As every small river has a rim of such forests, and the land is drained by a great number of brooks and rivers, these forests, notwithstanding their narrowness, resemble the extensive tropical woods of South America."

If we compare this description with Livingstone's, Grenfell's, Delcommune's, Wissmann's, and other reports on the forests of Central Africa, we will be safe in assuming, instead of Stanley's 250,000 square miles of forest, about 25,000 square miles.

The tribes inhabiting the region between the Kongo and Nepoko construct conical huts. East of the Nepoko, Stanley found the Mabode, who build square houses, and who were first described by Junker. Farther east he met one hundred and fifty villages of dwarfs, who are called Wambutti. He compares them to the Tikki Tikki or Akka, who live a little farther north. Junker met them among the Mabode on the Nepoko. They were called Achooa.

Stanley's reports regarding the state of affairs in Emin's province are very meagre. He confirms Emin's former report, that there are fourteen stations which are garrisoned by two battalions of regulars, who have 1,390 guns. Besides the regulars, Emin has irregular soldiers, sailors, tradesmen, merchants, and servants, — about 8,000 all told. Besides these, there are 10,000 women and children.

Evidently it is not the object of Stanley to take Emin home from his province; but, on the contrary, he intends to enable him to hold his own, and to enlarge his influence, by supplying him with

ammunition and provisions. Emin Pacha is an Egyptian officer, and Stanley travels as well for the Egyptian Government (which is almost an English government) as for the English Relief Committee, the president and secretary of which are Mackinnon and Mackenzie, who are also directors of the English East African Company. This fact is very significant.

Undoubtedly Stanley's silence regarding his interview with Emin Pacha is due to the fact that this interview was of a political character, and that its subject is not yet to be made public. It is very remarkable that Stanley did not carry a single line from Emin. His object was to save Emin's province for Egypt, that is to gain it for England, and to forestall any other power which might contemplate occupying that territory. We believe that Stanley has succeeded in doing so. Emin continues to consider himself an Egyptian officer. As the Sudan continues to be closed, his next object will be to open communication with the east coast through English territory, and thus his further course becomes self-evident. Stanley states in his letter that he does not contemplate returning on the Kongo route. Mr. Stokes, agent of the missions at the Victoria Nyanza, informed Dr. Meyer that he had long ago sent hundreds of loads of goods and provisions for Stanley to Kavirondo, on the east side of the Victoria Nyanza. The second English relief expedition, which started from Mombas in November of last year through English territory, and which was greatly helped by the discoveries of Count Teleki, who returned at that time to Mombas from the interior, will probably have advanced sufficiently far to help Stanley in reaching the coast and protecting the expedition from any attacks of the Wagonda. The latest rumors of Stanley's march eastward are quite probable, and presumably he will reach the coast at Mombas. But it is improbable that Emin Pacha will accompany him. He will stay at his post for Egypt—and for England.

THE LAKES OF THE SAN JOAQUIN VALLEY.

THE rapid contraction by evaporation of the three lakes of the upper San Joaquin valley, the consequent concentration of their waters into alkaline lies too strong for animal life, and the nature of the soils laid bare on their margins, have formed the subjects of investigation and discussion in several reports of the Agricultural Experiment Station of the University of California, especially in connection with the reclamation and cultivation of alkali soils. It is a matter of regret that it has not been possible to pursue the subject by personal visits as systematically as its practical importance and theoretical interest might have warranted; for we are here in presence of a group of phenomena that have been repeated many times in past geological epochs, and for the study of which, in their physical, chemical, and biological aspects, opportunity is not often afforded. Hence, while the information and data given in a bulletin issued by the experiment station June 15, are of necessity incomplete and fragmentary, they are of interest as affording an insight into processes regarding which but little is thus far on record.

A personal examination of Kern Lake, and of the region lying between it and Buena Vista Lake, as well as of the Mussel Slough country, made under the auspices of the United States census in March, 1880, satisfied Professor E. W. Hilgard that in none of these rich agricultural sections could the slightest increase of alkali be safely risked; and analyses subsequently made of the waters of both Kern and Tulare Lakes prove that a very few years' use of the water then filling either of these reservoirs would be promptly fatal to the productiveness of the lands irrigated. As regards Kern Lake, this was obvious enough from a casual examination and tasting of the water. Having been shut off from the natural influx of Kern River for a number of years, it has been rapidly evaporating and receding from its former shores, so that at the time of Professor Hilgard's visit a difference in level of over four feet had been produced in fifteen months, leaving high and dry a boat wharf built at that distance of time. About eighteen months before, all the fish and turtles in the lake had suddenly died, creating a pestilential atmosphere by their decay; and even the mussels were mostly dead, a few maintaining a feeble existence. A strong alkaline taste and soapy feeling of the water fully justified their choice of evils. The tule marsh, laid dry by the recession of the lake, was

thickly crusted with alkali; and the tules were dead, except where still moistened by the water of the lake, showing that the latter was not yet too strong for such hardy vegetable growth, albeit fatal to animal life.

Buena Vista Lake was stated to be in a similar condition, but not yet quite so far advanced in evaporation, and still maintaining some animal life in its waters, having lost its connection with the river more recently. Tulare Lake is well known to be full of fish, and, as it annually receives the overflow of Kern and the regular inflow of King's River, its evaporation and recession have been much slower; yet its water's edge is now distant several miles from the former shore-line, and, as the water of the river is more and more absorbed by irrigation, it will doubtless continue to recede until a point is reached at which the regular seepage from the irrigated lands will balance the evaporation.

A comparison of an analysis in 1888 with those made in 1880 shows that the solid contents of the water of Lake Tulare had increased very nearly two and a half times in eight years, and that its concentration approximated closely to that of Kern Lake in 1880. Yet it appears that an abundance of fish survived, at least of certain kinds, although the mussels had already succumbed.

Having been informed in November, 1888, that "the fish in Tulare Lake were dying by shoals," Mr. J. G. Woodbury of the State Fish Commission visited the north-eastern part of the lake, near the mouth of Cross Creek, during the first week in February.

On inquiry about the reported dying of the fish, the fishermen said that it occurred last summer and autumn, and that it was mostly catfish, "greasers," and some of the so-called trout, also some carp, but very few perch. Now, it is the perch that is so much valued by the fishermen; in fact, the perch is what they fish for, as the catfish do not sell so well, and the greasers are of no account. The "trout," they say, are very soft, and do not keep well, also are very insipid.

The perch are certainly very fine fish, large, bright, and clean-looking; they are also very good eating, as Mr. Woodbury had occasion to verify. These perch have enormous mouths, and in that of every one in the pound can be seen a "shiner" (or "slick," as they call the fish) with the tail sticking out of the great mouth, being drawn farther in as the process of digestion proceeds. One perch which he took along to have cooked, he took by the gills, and, looking down his big mouth, saw the tail of a fish, which he readily got hold of with his fingers and pulled out. It was six inches long, and only had its head partly digested. The fishermen say that all these perch, when caught, have fish in their mouths, in proof of which he pulled out one at random with a dip-net, and showed the perch with a shiner's tail still out of the mouth.

The fishermen state that no catfish are now caught, while two and three years ago they would get a wagon-load at each haul; also that trout are now seldom caught, although they used to be very abundant. The men expressed no opinion as to the cause of the death of the fish, but stated that the catfish especially were drifted upon the shore, dead, by thousands. Catfish, however, are found by millions at present in the creeks and sloughs that run into the lake.

All the shore of the lake for miles was strewn with mussel or clam shells. The surface of the ground was white with them, and the wheels of the carriage crushed through them, as though more than half the substance of the ground was actually made up of shells. These shells extend here as thickly as on top, down to the depth of a hundred feet. Not a live clam can be found in the lake now. Ten years ago there were large numbers of live mussels in Tulare Lake, and the hogs used to live on them. They would wade out into the lake, and plunge their heads under water, get hold of a mussel, and hold their noses up in the air and chew it up.

For the whole distance of twenty miles from Tulare City the country is of remarkable fertility, almost level; and, where put into wheat, the growth was strong even to within two miles of the shore of the lake. The lake must have been at some time a good deal lower than it is now, for near the mouth of Cross Creek there are many stumps which were under water only last year, and among which the fishermen used to get their nets entangled. These stumps are now just at the water's edge.

Analyses show an extremely rapid increase of the solid contents of the water between June, 1888, and February, 1889, as compared with the effect produced during the previous seven and a half years. The latter was about two and a half times or 150 per cent on the whole, or an average of 13 per cent a year; while in the eight months preceding the last examination the increase was nearly 45 per cent. It should be noted that these eight months were remarkable for very great evaporation elsewhere on the coast, also, and that they formed the end of three years of rather deficient rainfall in the State. The more abundant moisture of the season just passed may have stopped or perhaps even reversed the process.

It is hoped that all persons who may, from their own observation, be able to throw light upon the history of the recession of these lakes, will communicate the facts, so as to place them on record.

THE CAMERA ABROAD.

IN a recent article in *The Swiss Cross*, when speaking of photographing in foreign countries, I advised every one to become familiar, to some extent at least, with the French language, and particularly with the technical terms used in photography; the different portions of the apparatus; the chemicals; short phrases to be used in the custom-house, to the police, to hotel servants, etc.

I need hardly say that those who intend to visit the German fatherland ought to pursue the same course with the German language. As a general rule, the traveller will find that English is spoken tolerably well almost everywhere; but it is when he goes out, and rambles about in the country or in the older and more picturesque portions of cities and towns, that he comes in contact with a class of persons who rarely speak any other tongue than their own. The mere presence of a stranger in such places will attract notice. Any thing like sketching, drawing, or photographing will be sure to draw a crowd of idlers, who will sometimes render work in these places very unpleasant, or even at times quite impracticable. A little knowledge of the native tongue is invaluable under such circumstances.

I have frequently been asked the question whether the lower orders of the people in different European countries acted differently toward the out-door photographer. On the whole, I think I can say that there is less annoyance in Germany than in most other countries. I must, however, make this reservation: that if a public school is dismissed while the photographer is anywhere near, there is sure to be trouble. The children crowd around the camera, and spoil every thing. On one occasion I was fairly driven from the field from this cause; for, even knowing the language, I found it impossible to keep them from encroaching. There is no ill nature, however, in this sort of interference with photographic work; but in some parts of the Netherlands I have had very disagreeable encounters with drunken roughs, who persisted in standing directly in front of the instrument, even when they saw plainly that they were hindering the work.

Supposing that the amateur photographer starts for Germany on one of the comfortable Bremen or Hamburg steamers from New York: he will find himself pretty well in the fatherland from the moment when he sets foot on the vessel. The officers and crew are German to a man. The food is German, and so are the customs observed on the vessel. A very pretty one is the music which is generally furnished by the stewards during the dinner-hour every day, and early on Sunday mornings. At these times some piece of a solemn or religious character is always selected, and the effect made upon the mind by being thus awakened on a steamer in mid-ocean by religious music is not soon forgotten. The music at dinner, however, even on Sundays, is any thing but solemn in character; and the choruses to the well-known German convivial songs are joined in by all the passengers who can sing, and roared out right lustily, to the great satisfaction of those who, not being able to sing, contribute their part in screams of laughter and ringing applause. The good cheer at the table does not suffer neglect during all this babel of sounds, and, let me say in parenthesis, it is of unsurpassed quality. Americans are too apt to associate ideas of German cookery with sauerkraut and beer; but on these vessels such ar-

ticles are rather conspicuous by absence, and the table is furnished with every luxury that a pampered appetite could demand.

If the photographic apparatus is of small and convenient size, there will be numerous scenes and incidents on board a large ocean-steamer worthy of being recorded. The same apparatus could hardly be expected to answer for groups on the deck and for effective views of vessels passing. While steaming in the harbors of cities like New York, Hamburg, or Bremerhaven, capital instantaneous shots may be made at the water-craft of all kinds, but a lens of long enough focus to reach them nicely would probably be found unmanageable for groups of people on deck. If photography be attempted at sea while the vessel is rolling, take care to keep the camera level with the horizon, no matter what position the ship may assume. This, of course, is easier to say than to do; but, if neglected entirely, the pictures will make the level surface of the ocean appear like a steeply inclined plane. Remember that the forward part of the vessel is the most desirable standpoint for the camera, because the jarring motion of the screw is less felt here than in the after part. If the instantaneous shutter was a rather slow-working one, the outlines of the picture might be doubled by the vibration of the screw.

Those who are fond of making studies of clouds will here have an excellent opportunity. As a general rule, the best time to work is in the afternoon; and in selecting a position for the camera, take care that none of the ship's braces or shrouds cut across the field of the lens. This may happen at times when work has to be attempted in a hurry; as, for instance, when the pilot is taken on, when the tug comes for the mail, etc.

Great care must be taken not to expose the outfit, and particularly the sensitive plates or paper, to the damp sea-air for a longer time than is absolutely necessary. The sliding doors in the plate-holders should be constantly looked to, and special examinations made by red light at night to see that the spring cut-off in the slot of the holder closes properly when the door is withdrawn. A little time and trouble bestowed in this manner will be well rewarded by clean results, free from light-streaks and fog; for it will often happen that the cut-off swells just enough to leave a crack open when the door is pulled out, and the consequence is that every exposure is "light-struck." It is a good plan to take a sheet of fine sandpaper, a small screw-driver, and a sharp pocket-knife on all photographic excursions, so as to be prepared for accidents of the kind. The practice of throwing the focusing-cloth over the holder when the door is drawn out is a great protection to the film, and should always be done.

The port of Bremerhaven, where the amateur will probably land in Germany, offers little of interest; but just the reverse is true of Bremen, seventeen miles away. Of this I will speak in my next.

ELLERSLIE WALLACE, M.D.

PREPARATION AND PROPERTIES OF MANGANESE.¹

THE properties of manganese, like those of iron, appear to differ according to the method used in the reduction of the metal. When obtained from the oxide by heating with carbon, most authorities agree in the statement that the metal oxidizes so readily in the air that it can be preserved only under "rock oil" or in well-sealed vessels. In water it is said to "oxidize rapidly, with evolution of hydrogen, and crumbles into a dark gray powder." Cast manganese containing eight per cent of iron is said to be unalterable in the air.

In the year 1869, some manganese prepared after the process of Brunner (the reduction of the chloride mixed with fluorspar, by means of sodium) was found to have as little tendency to oxidation as iron. Repeating recently this process, pure chloride of manganese was fused in a clay crucible, and poured on a stone slab. When cold, it was pulverized, and mixed with an equal weight of powdered fluorspar. This mixture, divided into portions of one ounce, was introduced into a French clay crucible, previously heated to redness. Eighty grains of sodium, cut into small pieces and freed from naphtha, being added to each portion, the crucible was covered, and re-action allowed to take place before adding an-

¹ Paper read at the meeting of the chemical section of the Franklin Institute, Philadelphia, May 21, by Charles Bullock.

other charge. After six ounces of the mixture had been added, the contents of the crucible was covered with fused chloride of sodium in powder, the cover replaced, and the heat carried to quiet fusion. After the flux became entirely fluid, the heat was continued for ten minutes. The crucible was then removed from the fire, and, after cooling, the metal was found as a button at the bottom.

Three crucibles, of the capacity of eight fluid ounces each, were used at a time in a furnace without artificial blast. Care is necessary not to urge the heat too high, otherwise the crucibles will not resist the action of the fluorspar flux. The French-clay crucibles (Beaufay) were used, on account of their greater freedom from iron and silica; they also resist the flux better than the Hessian, black lead, or iron crucibles. The yield of manganese, under favorable circumstances, was about twenty per cent of the chloride used.

Reduction was also tried by using fused chloride of sodium without fluorspar. The yield of metal was much less, and differing in some of its properties from that obtained with the use of fluorspar. Manganate of soda was formed when sodium chloride alone was used as a flux. Manganese thus obtained is very brittle, with a steel-white fracture so hard that a file will scarcely touch it. The edges of the fractures scratch, and almost cut, glass. The metal retains the brightness of a fractured surface after prolonged exposure to the air, and appears not more disposed to oxidation than iron. It is entirely passive to magnetic attraction.

The specific gravity of the metal obtained when fluorspar was used was 7.072. When remelted under fused sodium chloride, the specific gravity rose to 7.153. The metal obtained without the use of fluorspar was less brittle, and had a different fracture. Its specific gravity was 7.231. Authorities differ regarding the specific gravity of manganese, ranging it from 6.85 to 8.013.

An examination of the metal obtained, using fluorspar as a flux, showed the absence of iron and the presence of calcium, demonstrating the reduction of some of the latter metal from the spar. This may account in a measure for the increased specific gravity on remelting under sodium chloride, as also the greater specific gravity of the metal when the spar was not used. As calcium has the specific gravity of 1.57, a small amount alloyed with the manganese would sensibly affect its gravity.

ETHNOLOGY.

Marriage Ceremonies of the Bilqula.

MR. PH. JACOBSEN, in a letter to his well-known brother, Capt. A. Jacobsen, gives the following description of the marriage ceremonies of the Bilqula of British Columbia. An Indian who intends to marry, calls upon his intended wife's parents, and arranges with them how much he is to pay for permission to marry the girl. Among people of high descent this is done by messengers, sometimes as many as twenty being sent to call on the girl's father. They are sent by the man's parents before the young man is of age. In many instances both man and girl are not more than eight or nine years

The messengers go in their boats to the girl's house, and marry on their negotiations without going ashore, where the relatives of the girl are standing. The messengers of the young man's parents praise his excellence and noble descent; the great exploits of his father, grandfather, and ancestors; their wars, victories, and hunting expeditions; their liberality at festivals; etc. Then the girl's relatives praise the girl and her ancestors, and thus the negotiations are carried on. Finally a number of blankets are thrown ashore by the messengers; and the girl's relatives protest, and maintain that the number is not sufficient to pay for the permission to marry the girl. In order to obtain their consent, new blankets are thrown ashore one by one, the messengers continually maintaining that the price paid is too great. Generally from twenty to fifty blankets, each of the value of about half a dollar, are paid.

After this the boy and the girl are considered engaged. When they come to be grown up, the young man has to serve a year to his father-in-law. He must fell trees, fetch water, fish, and hunt for the latter. During this time he is called Kos, which means

"one who woos." After a year has elapsed, the marriage is celebrated. At this time great festivals are celebrated. Seven or eight men perform a dance. They wear dancing aprons and leggings, trimmed with puffin-beaks, hoofs of deers, copper plates, and bells. If the groom should be a wealthy man, who has presented to his wife many small copper plates, such as are used as presents to a bride, these are carried by the dancers. The singing-master, who beats the drum, starts a song in which the dancers join. The song used at the marriage festival is sung in unison, while in all other dances each dancer has his own tune and song. The first dancer wears a ring made of cedar-bark. His hair is strewn with eagle-down, which flies about when he moves, and forms a cloud around his head. The groom presents the first dancer with a piece of calico, which the latter tears to pieces, which he throws down in front of each house of the village, crying, "Hoip!" in order to drive away evil spirits. These pieces of calico which he throws down in front of the houses have a lucky meaning, and at the same time express the idea that the groom, when he comes to be a wealthy man, will not forget the inhabitants of any house when giving a festival. The dancers swing their bodies and arms, stamp their feet, and show the copper plates to the lookers-on. Then the bride's father brings a great number of blankets, generally double the number of those he had received from the groom, and gives them to his daughter. The bride orders a few blankets to be spread before the groom. She sits down, and he puts his hand upon her head. Then the groom is given for each of the parts of his body one or more blankets. Finally he is given a new blanket. After the bride's father has given a blanket to each dancer and to the drummer, the villagers are invited to a great feast. At this time groom and bride eat for the first time together.

HEALTH MATTERS.

American Public Health Association.

THE preliminary circular relating to the next meeting of this association has just been issued. The meeting will be held at Brooklyn, N.Y., Oct. 22-25, 1889.

The executive committee have selected the following topics for consideration at said meeting:—1. The causes and prevention of infant mortality. 2. Railway sanitation: (a) Heating and ventilation of railway passenger-coaches; (b) Water-supply, water-closets, etc.; (c) Carrying passengers infected with communicable diseases. 3. Steamship sanitation. 4. Methods of scientific cooking. 5. Yellow-fever: (a) The unprotected avenues through which yellow-fever is liable to be brought into the United States; (b) The sanitary requirements necessary to render a town or city proof against an epidemic of yellow-fever; (c) The course to be taken by local health authorities upon the outbreak of yellow-fever. 6. The prevention and restriction of tuberculosis in man. 7. Methods of prevention of diphtheria, with results of such methods. 8. How far should health authorities be permitted to apply known preventive measures for the control of diphtheria. 9. Compulsory vaccination. 10. Sanitation of asylums, prisons, jails, and other eleemosynary institutions.

Papers upon miscellaneous sanitary subjects not included in the above list will be received by the executive committee, subject to the requirements of the By-Laws. Preference will be given, however, to papers upon the subjects selected by the committee in making up the daily programme of the meeting.

It is confidently expected that the Brooklyn meeting will be the largest and most important ever held by the association. The local committee of arrangements have already organized, and have the preliminary local work well under way. No efforts will be spared to make the meeting a grand success, and every arrangement necessary to the comfort of those attending will be made in ample season.

The growth and work of this association constitute a monument to American hygiene. It was organized in 1872, and has grown to be the largest association of its kind in the world, and embraces in territorial area the United States, the Dominion of Canada, and the Provinces. It has published fourteen large volumes on health subjects, one volume on disinfectants (which is the most complete

work of its kind in the English language), over one hundred and twenty thousand copies of the Lomb Prize essays, besides numerous reprints. The influence of this great work upon the public-health interests of the country can scarcely be estimated.

ICE-WATER. — In the opinion of the editor of *The Sanitary Volunteer*, the official organ of the New Hampshire Board of Health, there is a great deal of sentiment and many opinions, regarding the use of ice-water, that vanish when the light of reason and experience is turned upon them. The fact is, that ice-water, drank slowly and in moderate quantities, constitutes a healthful and invigorating drink. There is no doubt that ice is a great sanitary agent, and every family ought to be provided with it during the warmer months of the year. It is true that the inordinate use of ice-water, or its use under some special conditions and circumstances, is attended with great danger: so is the improper use of any other drink or food. The assumption that iced water is dangerous, and that iced tea, or iced coffee, or iced lemonade is a harmless substitute, is simply a delusion. As the source of danger feared by some is the degree of cold, we fail to see clearly how flavor modifies the effect of temperature. There are some individuals, undoubtedly, who cannot drink ice-water without injury, and who ought never to use it, but to a great majority of persons it is refreshing and healthful. Its use, temperate and discreet, is in no way to be condemned, which cannot be said of some of its substitutes.

THE MORTALITY AMONG NURSES. — The advocates of the non-bacillary origin of tuberculosis have sought support for their position in the immunity often enjoyed by nurses and attendants on the phthisical. That this immunity is the exception, and not the rule, seems indicated by recent studies by Cornet. In the *Zeitschrift für Hygiene*, Cornet publishes the tabulated results of his comparison of the mortality rates in the population of towns and cities and in nurses. These results are summarized in *The Medical News*. A large proportion of German nurses are members of religious orders, who, by reason of their secluded, regular lives, are removed from many causes of acute disease. Such nurses are in the best mental and moral condition to insure health, for which and other reasons the infective diseases ought not to be especially prevalent among them. Care was taken to select orders whose members serve for life and remain celibate. The material collected was from 38 cloisters, embracing an average yearly service of 4,028 women, whose aggregate service in years was 87,450. An examination of this material during twenty-five years revealed 2,099 deaths, 62.88 per cent of which were from tuberculosis, or nearly two-thirds. The usual proportion of deaths from tuberculosis is from one-seventh to one-fifth. Next to tuberculosis comes typhoid, while cancer shows a slightly increased rate of mortality. Death occurred among these nurses at an average age of 36.27 years, an average shorter life than that of workmen exposed to the inhalation of injurious dust, by eight or ten years. The death-rate from tuberculosis among nurses attains its maximum between the thirtieth and fortieth years, and then steadily declines. When a comparison of the death-rate of nurses and the population of a town is made, it is found that between the ages of 15 and 20 the mortality among nurses is four times that of other population; from 20 to 30, three times; from 30 to 40, twice as great; afterward becoming about equal. The explanation of these facts is found in the prevalence of tuberculosis among nurses, it being nine times more frequent than among other classes. All infectious diseases are more frequent among nurses until the fortieth year of life, after which their death-rate is lower than that of other classes. It is further shown that during the first six months of service the nurse enjoys comparative immunity from infection. After that, the mortality and morbidity rate steadily rises for three years, during which the greatest number of deaths occur. The life chances of nurses do not compare favorably with others. A nurse beginning her profession at seventeen has twenty-one and a half years of life less than a woman of the same age not exposed to infective diseases. So far as relative age is concerned, a nurse at twenty-five has the chance for life commonly enjoyed at fifty-eight; at thirty-three years, the outlook of a person aged sixty-two.

UNDERGROUND WATER AND BACTERIA. — Underground water and bacteria were the theme of a recent lecture delivered by Dr. C. Fraenkel, assistant to the famous bacteriologist, Dr. Robert Koch, in the Hygienic Institute at Berlin. The gist of the lecture was that the underground water of Berlin is free from bacteria, that this surprising fact is due to the great filtering-power of the ground, and that consequently the water drawn from the artesian wells is perfectly wholesome. These results do not correspond with those obtained in New York, where the water from artesian wells has in many, if not all, cases proved to be impure.

THE FLY AS A DISEASE-CARRIER. — With the bacteriologists, another domestic animal, the fly, is coming in for his share of incrimination for spreading infectious diseases. It has long been known that, if not the house-fly, at least some kinds which are near relations of his, have sometimes been guilty of causing malignant pustule by carrying the contagion of anthrax from diseased animals or animal substances to man. During the past year Dr. Alessi has been experimenting with flies to determine their liability to spread the infection of tuberculosis. The bacillus of this disease was found in the intestines and the excrement of flies which had feasted on tuberculous sputa; and their dried feces, in which, with the aid of the microscope, the bacillus was known to exist, was used for inoculating rabbits, and the animals became tuberculous. Thus it is found that the digestive tract of the fly is harmless to the germ. Spillmann and Haushalter have also made similar researches, with the same results; and lately, according to the *Annals d'Hygiène Publique*, a Mr. Howe, who has studied the subject in the Nile country, has found that the granular ophthalmia of that region can be spread by means of house-flies passing from the eyes of those who are affected with the disease to other persons.

BOOK-REVIEWS.

Principles of the History of Language. By HERMANN PAUL. Tr. by H. A. Strong. New York, Macmillan. 8°. \$3.

PROFESSOR STRONG has done a service to English readers by translating this work, which contains a more comprehensive survey of the principles of linguistic science and of the methods of studying it than can readily be found elsewhere. It may be said to consist of two parts, though they are not sharply separated. The earlier chapters deal mainly with the general principles of language and the chief determining causes of its development, while in the later ones these principles are followed out into their applications, and discussed with great fulness of detail, and wealth of illustration. Professor Paul has a very clear and correct conception of his favorite science, of its relation to the other sciences, and of the right mode of studying it. The science of language is not an exact science, much less a physical science, as Professor Max Müller maintains, but a department of history. Its principal basis is psychology, and the leading facts with which it deals are groups of ideas. The physical factor, however, must not be ignored; the language consists of spoken sounds, and it is only through the medium of the material world that we are able to communicate with our fellowmen. Nevertheless, the chief factor in its development is not the body, but the mind, and mind as it exists in society.

Having thus clearly indicated the scope and method of the science, Professor Paul goes on to state the leading causes of linguistic development. One of the chief of these is the tendency to sound-change; that is, to variability of pronunciation, which arise from slight changes in muscular action due to variations in the sensations attending such action. Another potent cause is change in the signification of words, which is perpetually going on, and which enriches the expressive power of language incalculably without adding any new words. This change in the signification of words is sometimes a restriction of the original meaning, sometimes an extension of it; while in other cases it takes the form of metaphor or some other figure of speech. Analogous to those developments are the numerous changes in syntax, while another and perhaps still more potent agent in the development of speech is composition, leading to inflection and word-formation. Professor

Paul also maintains, with many other scholars, that the power of original creation in language is by no means lost, but is as active to-day as ever; and he gives many examples of words of recent origin which he holds to be underived from any others. All original creations, both earlier and later, he believes to be imitative, so that on this point he is directly at issue with many other philologists. These are the fundamental causes of the development of language; but to these must be added analogy, which has a powerful influence by multiplying forms and usages that have arisen in some other way.

Having thus traced the outline of his subject, Professor Paul pursues it into all its ramifications through a series of chapters, which we have not space to analyze here, but which are sure to interest every student of philology. In these days, when there is so much superficial writing, it is pleasant to meet with a book at once so thoughtful and so scholarly as this by Professor Paul; and, though there are things in it that are sure to provoke criticism, it will be of great value to all students of the history of language.

Seraphita. By HONORÉ DE BALZAC. Tr. by Katharine P. Wormeley. Boston, Roberts. 12°. \$1.50.

THIS work is another of its author's studies in occultism. The leading character in the story, called sometimes Seraphita and sometimes Seraphitus, is intended as an example of the "twin soul" which we are told every one must have in order to attain to supreme felicity. Hence she is represented as acting in some cases like a woman, and in others as a man, though the reader may think that she doesn't act much like either. To make the bisexual quality still more prominent, this "strange being" is represented in her feminine character as inspiring love in a young man, and in his masculine character as awakening the same sentiment in a young woman. She talks grandiloquent nonsense about heaven, hell, prayer, and other themes of that sort, and at last is "translated" to the spiritual world; and so the story comes to an end. As for the story itself, it has very few incidents, and no interest at all except what attaches to its occult "philosophy," if any one can take an interest in that. For our part, we find it repulsive, like every thing else of the same sort; being neither philosophy nor religion, but a mere mass of fiction put forward as truth. Besides the principal story, the book contains two shorter ones of a similar character, which call for no special remark. There is also a long and wordy introduction by G. F. Parsons, which neither adds to nor elucidates the text, and has, so far as we can see, no reason to be.

La Société Française au Dix-septième Siècle. Ed., with notes, by Thomas F. Crane. London and New York, Putnam. 24°. \$1.50.

THIS book, which is intended primarily for students of French, consists of a large number of extracts giving an account of the new social life that arose in France in the early part of the seventeenth century. Every one knows that society and conversation have long been more important elements in French life than in that of other nations, and have had greater influence on French literature than

on any other. Students of literature and of social life are therefore alike interested in tracing the origin and growth of that society for which France has long been noted, and Professor Crane here offers them help in so doing. He has restricted himself to a portion only of seventeenth-century society, neglecting that of the court entirely, while even some elements of literary society are passed over. The extracts given treat successively of the Hôtel de Rambouillet and the persons who frequented it, of Mademoiselle de Scudéry and her rather pedantic companions, of the affected set who were nicknamed the *Précieuses*, and of the rules of politeness that prevailed in that age. As far as they go, they give a pretty clear view of the society of which they treat, of its follies and foibles, as well as its excellences; and they also show to some extent the growth of literature and the development of literary style. Some passages are almost repulsive from the self-admiration and mutual admiration they exhibit; but these were necessary to give a faithful picture of the times. Professor Crane's introduction gives useful information respecting the leading persons and topics dealt with, and other points of a more special character are treated in the notes. The book is convenient in form, and well printed.

AMONG THE PUBLISHERS.

THE July *Atlantic* opens with an article by Miss Preston, giving an account of the last days of Cicero, one of a series which she has been contributing to the *Atlantic*. Professor N. S. Shaler, who is a person to speak with authority, writes about "The Problem of Discipline in Higher Education," which will be read by student and teacher with equal interest. Mr. H. L. Nelson has an article on the "Speaker's Power," not a consideration of the power of oratory, but the power of the Speaker of the House of Representatives. Mr. W. H. Downes has an interesting paper on the "Old Masters" which may be seen in New York, and it is surprising to find how large a representation can be seen there. Another article is "Books that have Hindered Me," by Agnes Repplier. So much has been written about books that have helped various people, that Miss Repplier has decided to write about the books that did not help her. Among these she mentions "Sandford and Merton," Milton's "Areopagitica," and the "Heir of Redclyffe." The number closes with a knowing article on "Trotting Races," by H. C. Merwin.

—A. D. F. Randolph & Co. will publish at once the Duke of Argyll's work entitled "What is Truth?"

—J. S. Ogilvie has just ready, in his Fireside Series, "The History of the Great Flood at Johnstown, Penn."

—D. Appleton & Co. will publish immediately "Days Out of Doors," by Charles C. Abbott, author of "A Naturalist's Rambles;" "The History of a Slave," a startling picture of slavery in the Barbary States, by H. H. Johnston; and an interesting work on "Stellar Evolution and its Relations to Geological Time," by James Croll.

THE FORUM FOR JULY.

In the July number of The Forum, Prof. Geo. J. Romanes answers, in behalf of the Darwinians, the criticisms made of the Darwinian doctrine, by Prof. Mivart. It is an important summary of the present position of the best evolutionist thought.

Prof. W. J. McGee, of the U. S. Geological Survey, explains the supply of the different kinds of fuel, with especial reference to deposits in the United States. Other articles are:

The Scholar in American Life. Bishop Henry C. Potter. A Market for Books. Edward Everett Hale. Republican Party Prospects. Senator Justin S. Morrill. The Ethics of Journalism. W. S. Lilly. The Attitude of the French Canadians. Honoré Beaugrand. Late Theories Concerning Fever. Dr. Austin Flint. Organizations of the Discontented. Richard J. Hinton. Domestic Service. Jennie Cunningham Croly. The Better Side of Anglo-mania. Rev. H. Price Collier.

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— Messrs. Macmillan & Co. are publishing a series of "English Classics," consisting of selections from the leading writers in prose and verse, and supplied with numerous and quite elaborate notes. They are edited by various teachers in the colleges of India, and are more particularly intended for Indian students. We some time ago noticed one of the volumes of the series, — the two opening books of "Paradise Lost;" and we have now received another, — "Essays written in the Intervals of Business," by Arthur Helps, edited by Professors F. J. Rowe and W. T. Webb of Calcutta. The essays are of the easy and somewhat commonplace kind which their author was accustomed to write; but they contain many apt remarks, and to certain minds will doubtless be useful. They treat of every-day matters, such as "Practical Wisdom," "Self-Discipline," "Advice," "The Education of a Man of Business," etc., and are written in a smooth and pleasant style. The editors' notes are very full, consisting of analyses and explanations, and supplying all the information that any reader of the essays can possibly require.

— J. B. Lippincott Company announce the early publication of a midsummer novel called "Three Days," by Samuel Williams Cooper. The book will be beautifully gotten up, and fully illustrated by Hal Hurst and C. C. Cooper, jun., the well-known artists.

— Houghton, Mifflin, & Co. have just ready, in the series of American Statesmen, "George Washington," by Henry Cabot, in two volumes. Mr. Cabot has made a thorough study of the civil career and influence of Washington, and his work cannot fail to shed much light on the interior discussions and vexed questions which filled the years preceding, during, and following the Revolution. They have also just ready Edward Bellamy's "Looking Backward," translated into German by Rabbi Solomon Schindler; the

eighth part of the third series of W. H. Edwards's handsome work on "The Butterflies of North America;" and two more volumes in their Library Edition of Thackeray's works, — "Memoirs of Yellowplush" and "Burlesques, etc."

— Cassell & Co. will publish next month, from their London house, "The Year-Book of Commerce." This work, prepared especially for business-men, will form an annual statistical volume of reference, showing the movement of the foreign trade and general economic position of the leading countries of the world. It has been compiled under the authority of the London Chamber of Commerce, and is edited by Mr. Kenric B. Murray. Among the contributors will be Lord Brassey, Dr. R. Giffen, H. C. Burdett (secretary to the Stock Exchange), Mr. J. S. Jeans (secretary to the Iron Trade Association), Major Craigie (secretary to the Central Chamber of Agriculture), Mr. George Martineau, Mr. John Corbett, Mr. E. D. Milliet (of Berne, Switzerland), Mr. Boverton Redwood, Signor Luigi Bodeo (Rome); Dr. Becher (Berlin), M. E. Fournier de Flaux (Paris), etc.

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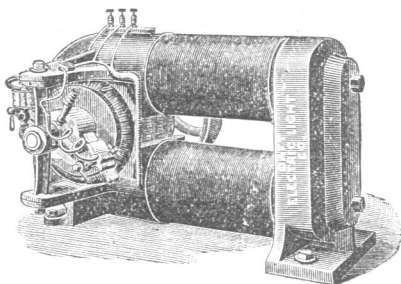
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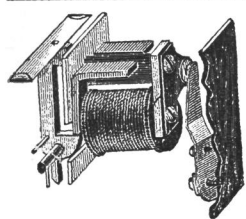
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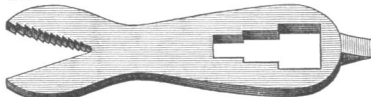
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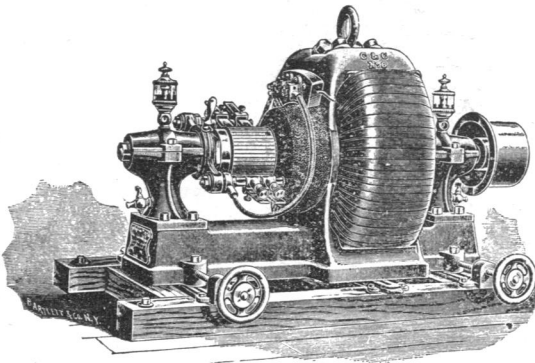
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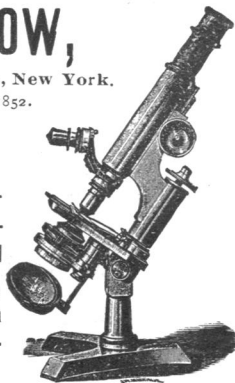
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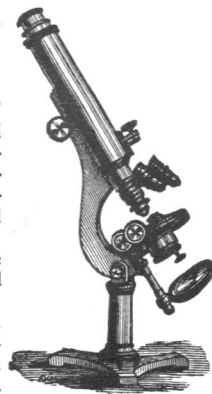
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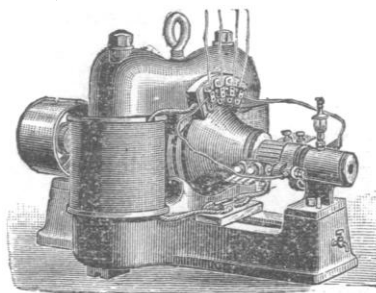
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